"Go to the page and work it from there" Young people's experiences of learning mathematics from a text

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While in many secondary classrooms the textbook remains a central resource for teaching and learning mathematics, its effectiveness is open to question. Drawing on research data from work in progress, this paper argues three things: that there can be a substantial disjunction between the assumptions and content of mathematics textbooks and the knowledge and experiences which students draw on in engaging with those texts; that this disjunction applies particularly to those students who are unsuccessful with this form of learning; and that an alternative approach, extending the work of Lave and Wenger (1991) and Wenger (1998) on communities of practice, offers a more inclusive and effective means of promoting mathematical understanding for such students.

Three core assumptions continue to inform the teaching of mathematics in many secondary classrooms: that it is learned from a textbook (Harries & Sutherland, 1999; Shield, 2000), that it is an individual process, and that it is separated from other curriculum areas and activities (Nickson, 2002). In this context, students are restricted to solving routine problems that are broken into discrete steps and isolated from their real world experiences. This form of learning continues to dominate many mathematics classrooms today as they are seen to transmit content that can be tested efficiently (Boaler, 2002), however in doing so, they create barriers for particular groups of students. This paper argues that experiencing mathematics in this way predisposes the formation of a student identity of marginality and non-participation (Wenger, 1998) in mathematics.

That a textbook will be selected and set for each class and subject has long been taken for granted by administrators, teachers and parents. This is the context within which this paper addresses the use of textbooks and student non-participation. What I wish to stress at this point, though, is that the case developed in this paper concerns the use of textbooks and their influence on the students referred to in this paper; it does not, *per se*, constitute a condemnation of all textbooks and all mathematics classrooms, nor should it be construed as one more exercise in "teacher bashing".

Several related explanations can be advanced for the taken-for-granted

attitude to the textbook and the manner of its use. Research indicates textbooks providing a routine approach to teaching and learning mathematics, thus relinquishing teachers from the responsibility for planning lessons which are engaging for students (Lubinski & Jaberg, 1997; Harries & Sutherland, 1999). It may also be that many teachers lack confidence in their own authority and knowledge of mathematics as a theoretically informed practice and discipline. Lacking the requisite expertise, they rely on textbook schemes to inform their classroom practice, teaching mathematics from exercises or chapters in textbooks with little or no conceptual framework for the subject (Harries & Sutherland, 1999). Lubinski and Jaberg (1997), found that content selection was largely framed around suggestions in textbooks and "restricted to topics and numbers that the textbook recommended" (p. 234), rather than around student learning and understanding. Students who struggle to keep pace with content delivery via textbooks are more likely to not participate as their learning needs are not addressed adequately.

Identity, participation and non-participation

From the perspective of a social theory of learning, identity lies at the intersection between learning and practice. Hence, learning in a community is about the formation of identity. However, what constitutes a community of learning, and what are its implications for learning and identity? Any discussion of a community of learning or practice is closely related to the work of Lave and Wenger (see Lave & Wenger, 1991; Wenger, 1998). Wenger (1998) for example, describes this type of community as a context where students learn and negotiate meaning through mutual engagement in joint enterprise. Practice in such communities exists because people engage and negotiate meanings with one another.

Identity reveals issues of marginality, a form of non-participation that restricts and prevents full participation. For example, a learner can be maintained in a marginal position in a mathematics classroom through the ingrained practice of using textbooks to teach and learn mathematics. Their use may close opportunities for future learning because it is framed around the content of texts and not student understanding. This practice has the potential to maintain an *identity of non-participation of marginality* (Wenger, 1998, p. 97) to such an extent that it becomes difficult for young people to consider a different path in the same community.

An identity of participation, however, locates learning as a vehicle for the inclusion of newcomers and for the development of identities. Exposing a newcomer to the practices of a community provides opportunities to engage in learning. As newcomers move inbound from *peripheral participation* (Wenger, 1998, p. 100), that is, participation which provides legitimate membership and exposure to the actual practices of a community, to *full legitimate participation* (p. 100), they gain knowledge, and shape a view of themselves as members of that community. Learners need to be able to invest themselves in a community that provides opportunities to shape an identity

based on participation, rather than being held in marginal positions where identities of non-participation are manifested and maintained.

From the students' perspectives

Forty-three young people took part individually in 20–30 minute semi-structured interviews. The students provided accounts of their experiences of learning mathematics in school and TAFE. The students were participants in a Youth Reconnected Program at a TAFE College. This program was designed to support young people who were early school leavers or non-completers of school[1] by improving their literacy and numeracy skills so they could access further education or enter the workplace (DEST, 2002). The interviews were conducted by the researcher and took place at the College over a period of three weeks. A qualitative method, critical discourse analysis was applied to the texts. Selected excerpts are utilised in this paper to demonstrate that shaping of an identity of participation for some students is influenced by the practice of using textbooks in classrooms.

What was learning mathematics like for you in school?

What was of interest in the study was how the young people described their experiences of learning mathematics from a textbook, which in turn influenced their mathematics learning, and how they identified themselves as participants (or not) in such a community. They responded with accounts that described how they felt they did not learn and identify with a community of learners, but rather identified themselves as failures who felt marginalised or excluded from that community. In the following excerpt, Peter tells about his experiences of learning mathematics with the teacher using maths sheets and a book. He states that he found learning this way boring.

> Peter: They just gave me … the teacher usually just gave me a little maths sheet and I just had to do it or a maths book and we just had to complete the maths book. That is it, and it is the same up here too. [They] just give you a maths book and you just work through it. Pretty boring, you just sit there looking at the questions and you've got some teachers who don't really care, so they just sit there and so when you ask for help they show you on the board but they don't show you what it does and how to do it. They just show you the answer.

Several characteristics related to textbook use in classrooms are indicated in this excerpt. For example, when learners are expected to learn mathematics in this way, teachers may or may not provide some explanation of the task.

1. Early school leavers are defined as young people who left school before the school leaving age of fifteen or before or on completion of Year 10; non-completers are students who left school before completion of Year 12 (Ball & Lamb, 2001).

When it is provided, it seems to be done on the blackboard. This practice does not allow learners to develop a meaningful understanding of the problem nor negotiate this meaning with the teacher and or other students. In the next excerpt, Michael provides an account of his learning experiences.

Michael: He just, he had a textbook with all the things and that and he would just write it up on the board, give you like minutes, and show you working. Then like because there is the whole class, does not give you much time to show everyone, some people do not learn as quick as the others and that. And then you just lose track, cannot keep up, you are just up to your neck in homework and that… Oh yeah, like, 'cause like, say you're trying to get something, but then by the time you think you've got it sought of sussed he's already putting something else on there and that. He does not (care), does not (really teach you), does not really show it.

Michael describes in some detail how he felt as a learner. He indicates several issues found to be common with textbook use, that of teaching the same content to the whole class, the pace of the lesson, and homework as a consequence of not keeping pace with the class. It would seem from these two excerpts that the ingrained practice of textbook use is influential to student engagement and participation, thus potentially marginalising learners from their classroom. Angelique elaborates this point.

Angelique: Okay, yeah, we would just walk in and sit down with our textbooks. He would write up all this stuff on the board to go to. You would have to go to the page that he has written. It is like page 236 blah, blah, blah. You would just go to that, he says work from your book, and then he gives you, writes all the answers on the board. That is all you do in high school, work from your textbook. And it was pretty difficult stuff, not easy… It was hard, because I did not know the basics, as I said. I did not know the basics so coming to do all this was hard, so I just blocked off. Like I would just sit there and that is how I got bad grades and stuff cause I would just sit there and would not pay attention.

When learners are told to turn to a page and then expected to *do it*, little wonder Angelique, and others like her found learning mathematics difficult and boring. Learners in this context are more likely to opt for excluding themselves because they simply cannot keep up as a consequence of their difficulties with learning mathematics from a textbook. Andrew reports on his experience.

Andrew: Well, normal learning, the teacher just would stand up and explain the maths, how to do the maths and then you got maths textbooks and they tell you what page to go to, and then you

would go to there and start working through. The people that didn't, who didn't understand it the first time would be told and he would walk around trying to tell everyone but he sought of, I can't remember him ever coming to help me. He did occasionally, and then it's like time ran out and he was too busy with all the people, so he didn't have enough time to teach everyone the first time, and then go around and double check that everyone knew it sort of… I didn't really get involved in the conversations, like when they were talking about it, I didn't involve, just get involved with it all because I don't know, I'd get it wrong or something, so I just really, no I didn't feel like I was a part of the class really.

Andrew's and Angelique's accounts highlight the barriers that some students are confronted with in their mathematics learning. When their experiences are restricted to a textbook and explanations by way of the chalkboard, it is not surprising that they do not participate, but rather withdraw or marginalise themselves from mathematics classrooms or worse, school. Asia's and Troy's reportage illustrates the intensity of feeling manifested in this situation and the consequent rejection of school mathematics.

Asia: A regular maths lesson? We just have to, like it was our textbooks, we just had to look up our textbook, go to the page we had to go to and write in our book and work it from there. The teacher hardly ever explained it to us and so… it was CRAP… I would have liked the teachers to like, like TELL us about it, help us work it out and like teach us how to do it properly, whereas we never got that.

Troy: Just roll up to class with those thick maths books and you just go, start from the front and go right through, through the whole book in a year… the way they were explaining it to me, I could not pick up. It was just, I did not know, it was hard… I just caused trouble then, because I could not do it. I caused trouble and got kicked out of school. I do not think, like, I just kept on getting worse.

What was learning mathematics like in TAFE?[2]

Fortunately, such situations are neither necessary nor inevitable. These students who failed school or withdrew from it found a more congenial and supportive context in the TAFE Program. While a textbook was used in this context as a guide for their learning, their experience of a more accepting learning community provides empirical support for the work of Lave and Wenger (1991) and Wenger (1998) and indicates the possibilities for success-

2. No generalisation on pedagogic differences between TAFE and secondary schooling is possible. At issue here, rather, is the difference in pedagogy and in particular the use of textbooks as experienced by the students in this study.

ful learning implicit in a more inclusive social community of learning. Here, Damien and Trevor discuss the similarities and differences between school and TAFE learning.

Damien: For similar, it is the same kind of maths… exactly the same. But the teachers are different. I think here is easier to learn because the teachers actually come round and show you what to do, they sit with you and actually show you how to do it… make sure you know after they leave… Yeah… probably a more sense of belonging here than was school… you just feel like the teachers respect you and you respect them and that.

Trevor: You get, as an adult, how they get taught… and there is better things here… the maths is common sense… Every time you get into trouble they try and get us out of trouble… so we do not get into bad behaviours or anything like that.

The lack of reference to textbooks is noteworthy. In the TAFE setting, textbooks were used for all students. In discussing the school situation they were quick to raise the issue of textbooks and their objections to them. Given their positive response here to the TAFE context, it seems reasonable to infer their acceptance of the textbooks. Ali's and Asia's accounts seem typical.

Ali: It's quite similar [to school]… But see we've got three teachers that come in for our maths which is good and we're sharing them around so it is a lot easier to get their attention and they can help you and actually stick with you… So, but the maths we're doing now is mainly booklets… not really exciting stuff but still good, like with the teachers.

Asia: Mary [teacher] and that will like sit there with us and explain it to us and like help us like they will sit there with us and help us do the booklet. Whereas if in a normal classroom, say thirty odd students in there the teacher couldn't do that and they weren't allowed to cause like you have to get tutors something in. But here it is more better because I am learning more here than we would in a normal classroom.

Hence, as noted earlier in this paper, what is at issue is not so much the use of textbooks per se, but the manner of their use and the context in which they are set. It seems evident that, *vis-à-vis* the secondary mathematics classroom, the TAFE setting more closely approximated an inclusive social community of learners, in which the transition from marginality to full legitimate participation was encouraged and supported.

The use of textbooks in secondary and TAFE classrooms

On the basis of the interview data, it can be argued that the reason the students referred to in this paper chose not to participate in their learning was because they had personal learning difficulties. While this may be the case, a close analysis suggests that these students may never win. That is, despite their efforts to try, learning mathematics from a text, with little or no support from the teacher, just became too difficult. Such taken for granted practices contribute to the maintenance of unequal relations in some mathematics classrooms. In consequence, when students contest or challenge these relations they are either coerced or eliminated from the classroom. In some instances, this exclusion may contribute to students leaving school early. Through this process, students are blamed for their inability to learn, when in fact the opposite may be the case: the taken for granted practice of using textbooks for all learners positions students as have learning difficulties or who are problems in the classroom.

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